REMARKS

Claims 16, 19 and 20 were rejected under 35 USC 103(a) over Adan (US 6, 172, 354 B1), and claims 21 and 22 were rejected under 35 USC 103 (a) over Adan in view of Scenna (US 5, 894, 302). These rejections are traversed as follows. Claim 16 has been amended to distinguish over and avoid Adan. It appears that the Examiner is mistaken about applicability of Adan to claims 19 and 20, and these claims have been left unamended in favor of clarification of Adan. Claims 21 and 22 have been amended to distinguish over and avoid the Adan portion of the cited combination of Adam and Scenna.

In the remarks that follow it is convenient to employ the following convention to refer to an area of interest within the text of a patent. For example, if we were supporting the notion that Adan does not correlate over the entire viewing area, we could refer to lines 3-13 of col. 6 in Adan as "Adan @ 6:3-13" (col. # : ln. #'s).

The amendments to claims 16, 21 and 22 are all the same and deal with the manner in which correlation is performed. It is perhaps easiest to point out what the amended portions of those claims mean, and then contrast that with Adan.

Refer to applicants' Specification at line 27 of page 4 through line 6 of page 7. Note especially the analogy to the sheets of film, and to the discussion (related to prediction) of how the amount of overlap of the sample and reference frames varies according to the amount of shifting. (The discussion there emphasizes prediction, but it is very apparent from what is said there that prediction is just another instance of shifting.) What is clear is that the correlation of applicant's technique is applied to **all** overlapping data in the sample and reference frames. Of course, how much data still overlaps depends on what shifting has been done; the point is that we want to use it all, however much it is.

Claims 16, 21 and 22 have been amended to emphasize this manner of operation. We reproduce below the amended claim element (a "wherein the ..." clause for the preceding optical motion detection circuit):

> "wherein the optical motion detection circuit comprises [a plurality]an array of photo detectors each having an output, a memory containing a reference frame of digitized photo detector output values that is stored in a reference array of memory locations corresponding to the array of photo detectors and a sample frame of digitized photo detector output values obtained subsequent to the reference frame and that is stored in a sample array of memory locations corresponding to the array of photo detectors. and further wherein a plurality of comparison frames, each being a shifted version of one of the reference frame or the sample frame, is correlated with

the other of the reference frame or the sample frame to ascertain motion in the directions along the first and second axes, the correlation being upon the values in all memory array locations that correspond to overlap between the comparison frame and the other of the reference frame or the sample frame ... "

The earlier recited "plurality" of photo detectors is now "an array" of photo detectors. This is a simple change in terminology that cooperates with subsequent amendatory language. Next, the digitized photo detector output values are recited as being "stored in a reference array of memory locations corresponding to the array of photo detectors" (for the reference frame) and "stored in a sample array of memory locations corresponding to the array of photo detectors" (for the sample frame). Finally, the amendment recites that the correlation is "... upon the values in all memory array locations that correspond to overlap between the comparison frame and the other of the reference frame or the sample frame ... " In short, the amended claim clarifies that correlation is performed upon as much data from the photo detectors as possible. We have "frames" that represent everything seen by the photo detectors and that overlap more or less according to previous shifting. **Correlation is on the entire region of overlap.** That this is so is sensible and not surprising. It is also supported by the Specification as originally filed (and at the passage quoted above), and thus does not represent any new matter whatsoever.

However, the situation described above and recited in claims 16, 21 and 22 (each as amended) is not what is described or suggested in Adan. In describing Fig's 3A-3E Adan @ 6:5-13 sets out an entire viewing area 123 and a smaller sample area 124. See also those figures. At 7:6-12 Adan says that detection of movement can be performed by cross correlation, and then goes on to say that "Cross correlation between the pattern in the sample area 124 and the pattern for the entire viewing or search area 123 is defined as follows: <there follows Eq. 1>" In other words, Adan says that his correlation involves the viewing area 123 and a **subset** of that (the sample are 124). And lest one think that the material at 7:42-43 undoes this with a statement about Eq. 2 that "the values of x and y are moved throughout the entire viewing region..." one should also note that the indices for the sigma notation summations in both Eq. 1 and Eq. 2 involve Lp/2, where Lp is the length of the (subset!) sample area 124 (7:21). Adan does not correlate shifted versions of entire viewing areas, as would correspond to what is claimed. **He correlates among subsets of what is seen by the detectors.**

The above argument is a traverse for claims 16 and 21-22, each of which incorporate the described amendment.

We turn now to the rejection of claims 19 and 20, which deal with suspension of the coupling of coordinates to the computer system when some adverse condition is detected. For claim 19 it is unsatisfactory correlation, and for claim 20 it is excessive velocity. The Examiner's letter states that the reason for the rejections of claims 19 and 20 are found in Adan @ 7:5 - 9:23. With all due respect, the Examiner is surely mistaken. We have already seen that the material from 7:5 - 7:59 deals with correlation, and a re-reading confirms that it deals only with some kind of basic correlation for movement detection. There is no mention whatsoever of any analysis of the correlation outcome for an additional purpose, such as the recited decision to not output coordinates to the computer system, whether based on correlation or a velocity criterion. In particular, there is not mention of the correlation surface. And what of the balance of the cited passage? Beginning at 7:60, it deals with the use of circular harmonics to detect motion. A close reading of this likewise reveals no mention whatsoever of the recited decision to not output coordinates to the computer system, whether based on correlation or a velocity criterion. The Examiner is respectfully urged to withdraw these rejection; they are simply not supported by Adan.

Thus, on the basis of the arguments set out above, claims 16-22 are believed to comply with 35 USC 103, and the Examiner is respectfully, but earnestly, urged to withdraw the rejections.

THEREFORE, further examination is requested, and favorable action is respectfully solicited.

Respectfully submitted,

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PATENT

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE
ART UNIT 2675
Examiner Srilakshmi Kumar

IN THE PATENT APPLICATION OF Gary B. Gordon, et al.
CASE: 10980359-6
SERIAL NO: 09 / 753, 805
FILED: 2 January 2000
SUBJECT: "SEEING EYE" MOUSE FOR A COMPUTER SYSTEM

THE COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, D.C. 20231

SIR:

(REPLACEMENT) AMENDMENT "C"
(MARKED-UP VERSION)

In The Claims

☞ Please **amend** the three claims 16, 21 and 22 as re-written below:

--16.(as amended) A hand held pointing device for a computer system, the pointing device comprising:

a housing having a bottom surface that moves against a desktop surface;

the housing also having a top surface shaped to receive the human hand;

the housing also having a skirt connecting a perimeter of the bottom surface with the top surface;

the housing also having a first axis extending generally in the direction from where the heel of the hand rests on the top surface to where the middle finger rests on the top surface, and a second axis perpendicular to the first, both axes parallel to the bottom surface;

an aperture in the bottom surface;

a source of non-coherent illumination mounted within the interior of the housing, proximate the aperture, that illuminates, from a single location and with an angle of incidence in the range of about five to twenty degrees, a portion of the desktop surface opposite the aperture and having surface height irregularities forming a micro texture with feature sizes in the range of about five to five hundred microns, the illumination producing highlights upon surface height irregularities that extend out of the desktop surface and that intercept the illumination and shadows upon surface height irregularities that extend into the desktop surface and whose illumination is blocked by adjacent surface height irregularities that are illuminated, the highlights and shadows forming a pattern that varies as a function of rotations and translations of the aperture relative to the desktop;

an optical motion detection circuit mounted within the interior of the housing and optically coupled to the highlights and shadows from the surface height irregularities of the illuminated portion of the desktop surface, the optical motion detection circuit producing motion signals indicative of motion in the directions along the first and second axes and relative to the surface height irregularities of the illuminated portion of the desktop surface; and

wherein the optical motion detection circuit comprises [a plurality]an array of photo detectors each having an output, a memory containing a reference frame of digitized photo detector output values that is stored in a reference array of memory locations corresponding to the array of photo detectors and a sample frame of digitized photo detector output values obtained subsequent to the reference frame and that is stored in a sample array of memory locations corresponding to the array of photo detectors, and further wherein a plurality of comparison

frames, each being a shifted version of one of the reference frame or the sample frame, is correlated with the other of the reference frame or the sample frame to ascertain motion in the directions along the first and second axes, the correlation being upon the values in all memory array locations that correspond to overlap between the comparison frame and the other of the reference frame or the sample frame.--;

--21.(as amended) A hand held pointing device for a computer system, the pointing device comprising:

a housing having a bottom surface that moves against a work surface;

the housing also having a top surface shaped to receive the human hand;

the housing also having a skirt connecting a perimeter of the bottom surface with the top surface;

the housing also having a first axis extending generally in the direction from where the heel of the hand rests on the top surface to where the middle finger rests on the top surface, and a second axis perpendicular to the first, both axes parallel to the bottom surface;

an aperture in the bottom surface;

a source of illumination mounted within the interior of the housing, proximate the aperture, that illuminates a portion of the work surface opposite the aperture and having surface height irregularities forming a micro texture with feature sizes in the range of about five to five hundred microns, the illumination producing a pattern of highlights upon surface height irregularities that extend out of the desktop surface and that intercept the illumination and of shadows upon surface height irregularities that extend into the desktop surface and whose illumination is blocked by adjacent surface height irregularities that are illuminated;

an optical motion detection circuit mounted within the interior of the housing and optically coupled to the pattern of highlights and shadows from the surface height irregularities of the illuminated portion of the work surface, the optical motion detection circuit producing motion signals indicative of motion in the directions along the first and second axes and relative to the surface height irregularities of the illuminated portion of the work surface;

wherein the optical motion detection circuit comprises [a plurality]an array of photo detectors each having an output, a memory containing a reference frame of digitized photo detector output values that is stored in a reference array of memory locations corresponding to

the array of photo detectors and a sample frame of digitized photo detector output values obtained subsequent to the reference frame and that is stored in a sample array of memory locations corresponding to the array of photo detectors, and further wherein a plurality of comparison frames, each being a shifted version of one of the reference frame or the sample frame, is correlated with the other of the reference frame or the sample frame to ascertain motion in the directions along the first and second axes, the correlation being upon the values in all memory array locations that correspond to overlap between the comparison frame and the other of the reference frame or the sample frame; and

a switch disposed on the skirt in a location underneath the right thumb or the left ring finger of a hand grasping the pointing device, that is coupled to the optical motion detection circuit and that inhibits the output of the motion signals to the computer system when the hand activates the switch by squeezing against the skirt in a plane parallel to the bottom surface in order to lift the pointing device away from the desktop surface.--; and

--22.(as amended) A hand held pointing device for a computer system, the pointing device comprising:

a housing having a bottom surface that moves against a work surface;

the housing also having a top surface shaped to receive the human hand;

the housing also having a skirt connecting a perimeter of the bottom surface with the top surface;

the housing also having a first axis extending generally in the direction from where the heel of the hand rests on the top surface to where the middle finger rests on the top surface, and a second axis perpendicular to the first, both axes parallel to the bottom surface;

an aperture in the bottom surface;

a source of illumination mounted within the interior of the housing, proximate the aperture, that illuminates a portion of the work surface opposite the aperture and having surface height irregularities forming a micro texture with feature sizes in the range of about five to five hundred microns, the illumination producing a pattern of highlights upon surface height irregularities that extend out of the desktop surface and that intercept the illumination and of shadows upon surface height irregularities that extend into the desktop surface and whose illumination is blocked by adjacent surface height irregularities that are illuminated;

an optical motion detection circuit mounted within the interior of the housing and optically coupled to the pattern of highlights and shadows from the surface height irregularities of the illuminated portion of the work surface, the optical motion detection circuit producing motion signals indicative of motion in the directions along the first and second axes and relative to the surface height irregularities of the illuminated portion of the work surface;

wherein the optical motion detection circuit comprises [a plurality]an array of photo detectors each having an output, a memory containing a reference frame of digitized photo detector output values that is stored in a reference array of memory locations corresponding to the array of photo detectors and a sample frame of digitized photo detector output values obtained subsequent to the reference frame and that is stored in a sample array of memory locations corresponding to the array of photo detectors, and further wherein a plurality of comparison frames, each being a shifted version of one of the reference frame or the sample frame, is correlated with the other of the reference frame or the sample frame to ascertain motion in the directions along the first and second axes, the correlation being upon the values in all memory array locations that correspond to overlap between the comparison frame and the other of the reference frame or the sample frame; and

a switch disposed on the skirt in a location underneath the left thumb or the right ring finger of a hand grasping the pointing device, that is coupled to the optical motion detection circuit and that inhibits the output of the motion signals to the computer system when the hand activates the switch by squeezing against the skirt in a plane parallel to the bottom surface in order to lift the pointing device away from the desktop surface.--.

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